

LISTING OF CLAIMS:

This listing of claims will replace all prior versions of claims in the application:

- 1 1. (currently amended) A method for manufacturing a magnetoresistive sensor
2 comprising:
3 providing a substrate:
4 forming a photoresist mask over a desired sensor area
5 depositing a magnetic hard bias material;
6 removing said photoresist mask to form a trench in said layer of magnetic hard
7 bias material;
8 depositing a plurality of sensor layers as full film layers such that a portion of the
9 sensor layers is deposited into the trench and another portion of the sensor
10 layers is deposited outside the trench; and
11 chemical mechanical polishing sufficiently to remove portions of said sensor
12 layers formed outside said sensor area.

- 1 2. (Original) A method as in claim 1 wherein said plurality of sensor layers includes
2 a free layer, said method further comprising:
3 before forming said photoresist mask and before depositing said hard bias
4 material, depositing a dielectric material of such a thickness that said hard bias
5 material will align with said free layer.

1 3. (Original) A method as in claim 2 further comprising, after removing said
2 photoresist mask, performing a material removal process to remove portions of said
3 dielectric material not covered by said hard magnetic material.

1 4. (Original) A method as in claim 2 further comprising, after removing said
2 photoresist mask, performing a reactive ion etch (RIE).

1 5. (Original) A method as in claim 2, wherein said dielectric material comprises
2 SiO₂.

1 6. (Original) A method as in claim 1, wherein said substrate is a magnetic,
2 electrically conductive material.

1 7. (Original) A method as in claim 1, further comprising, after depositing said hard
2 magnetic material, depositing an electrically insulating material.

1 8. (Original) A method as in claim 1, further comprising, after removing said
2 photoresist mask, depositing a dielectric material, and then performing a reactive ion etch
3 to remove horizontally disposed portions of said dielectric material.

1 9. (Original) A method as in claim 8 wherein said dielectric material comprises
2 SiO₂.

1 10. (Currently amended) A method of manufacturing a current perpendicular to plane
2 (CPP) magnetoresistive sensor, comprising:
3 forming a first electrode;
4 depositing a first full film layer of electrically insulating material onto said first
5 electrode;
6 forming a photoresist mask over a desired sensor area;
7 depositing an electrically conductive seed layer;
8 electroplating a magnetic, high coercivity hard bias material onto said seed layer
9 ~~laeyr~~;
10 depositing a second electrically insulating layer;
11 removing said photoresist mask to form a trench in the layer of magnetic material;
12 depositing SiO₂, conformally to cover horizontal and non-horizontal surfaces;
13 perform a reactive ion etch (RIE)- ;
14 depositing a plurality of full film sensor layers such that a portion of the sensor
15 layers is deposited into the trench and another portion of the sensor layers is
16 deposited outside of the trench;
17 performing a chemical mechanical polishing (CMP) process; and
18 depositing a second electrode;

1 11. (Cancelled)

1 12. (currently amended) A method of manufacturing a magnetoresistive sensor,
2 comprising:
3 providing a substrate;
4 forming a photoresist mask in a sensor area, said mask having first and second
5 laterally opposed sides;
6 depositing a magnetic material, at least a portion of said magnetic material
7 defining first and second magnetic layers extending from said laterally opposed
8 sides of said mask;
9 removing said photoresist mask to define a trench between said first and second
10 magnetic layers; and
11 depositing sensor material layers, at least a portion of said sensor material layers being
12 deposited in said trench; and ~~A method as in claim 11 further comprising, after~~
13 ~~depositing said sensor material layers,~~ performing a chemical mechanical
14 polishing process to removed portions of said sensor material disposed outside of
15 said trench.

1 13. (Original) A method as in claim 12 further comprising, after depositing said
2 magnetic material, depositing a physically hard insulating material layer.

1 14. (Original) A method as in claim 13 wherein said physically hard insulating
2 material layer is alumina (Al₂O₃).

1 15. (Original) A method as in claim 13 wherein said physically hard insulating
2 material layer is diamond like carbon (DLC).

1 16. (Original) A method as in claim 13, wherein said physically hard insulating
2 material layer is SiO₂.

1 17. (currently amended) A method for manufacturing a magnetoresistive sensor,
2 comprising:

3 providing a first electrode having an upper surface;

4 depositing a layer first layer of SiO₂ onto said upper surface of said electrode;

5 forming a photoresist mask on said first layer of SiO₂;

6 depositing an electrically conductive seed layer;

7 depositing a high coercivity magnetic material onto said seed layer;

8 lifting off the photoresist mask to form a trench in said high coercivity magnetic
9 material;

10 depositing a physically hard insulating material;

11 depositing a second layer of SiO₂;

12 performing a reactive ion etch process;

13 depositing sensor material layers such that a portion of the sensor material layers

14 is deposited into the trench and another portion of the sensor material layers is

15 deposited outside of the trench;

16 perform a chemical mechanical polishing process; and

17 depositing an electrically conductive material to form a second electrode.

1 18. (Withdrawn) A magnetic head comprising:
2 a first electrode;
3 a magnetoresistive sensor having first and second laterally opposed sides
4 a and formed upon said first electrode'
5 first and second electrically insulating walls formed at said first and second sides
6 of said sensor;
7 first and magnetic hard bias layers extending laterally outward from said first and
8 second walls;
9 first and second physically hard electrically insulating layers formed over said
10 first and second hard bias layers; and
11 a second electrode formed over said sensor and said physically hard electrically
12 insulating layers.

1 19. (Withdrawn) A magnetic head as in claim 18, wherein said physically hard
2 electrically insulating layers comprise alumina (Al_2O_3).

1 20. (Withdrawn) A magnetic data memory system, comprising:
2 magnetic disk;
3 a motor connected with said disk rotating said disk;
4 a slider;
5 an actuator connected with said slider to position said slider adjacent said disk;

6 a magnetic sensor connected with said slider, said sensor comprising:
7 a first electrode;
8 a magnetoresistive sensor having first and second laterally opposed sides
9 a and formed upon said first electrode'
10 first and second electrically insulating walls formed at said first and
11 second sides of said sensor;
12 first and magnetic hard bias layers extending laterally outward from said
13 first and second walls;
14 first and second physically hard electrically insulating layers formed
15 over said first and second hard bias layers; and
16 a second electrode formed over said sensor and said physically hard
17 electrically insulating layers.